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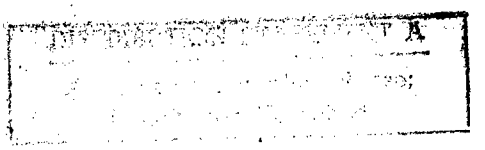
COMPUTER DEVELOPMENT AND APPLICATIONS -- III



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CONTENTS

WAN LI ADDRESSES PLANNING CONFERENCE ON COMPUTERS AND INTEGRATED CIRCUITS

Beijing JINGJI RIBAO in Chinese 16 Jun 83 pp 1-2

[Speech by Wan Li [8001 6849] delivered at the Closing Ceremony of the National Electronic Computer and Integrated Circuit Planning Conference]

[Text] Comrades:

This meeting is over and I am required to say a few words. Since it appears that I must give a talk, I will add a few sentences. First are my views on this meeting; second is how to do a good job in implementing the plans.

Remembering the opening day, I simply stated the importance of this meeting. Our country has to have many meetings each year; however, this meeting on the special problems of the national planning of electronic computers and integrated circuits is the first since the founding of the country.

You comrades who are present understand better than I do that electronic computers and integrated circuits are a new technology, a brand new kind of production force. In some advanced countries, electronic industrial products have penetrated deep into the various areas and aspects of the national economy, culture and education, national defense build-up, and social life, becoming one of the important indicators weighing a nation's economic and military strength. Recently Comrade Fang Yi [2455 3015] held talks with the Americans. Primarily because of the problem of national defense, they are afraid that we will become strong so key technological equipment transfers are not possible. In these areas we are too far behind--at least 10 or more years behind. We want to quadruple our plans. To realize the four modernizations we must develop electronic computers and integrated circuits. If we fail to do this, the modernization program cannot be achieved. Today the Capital Iron and Steel Company reported to you and I supported the company in its early application of electronic computers in the areas of production and management. Now they are doing fairly well in business management where they have advanced toward modernization. They have undergone a big change in appearance. It can be visualized that as a new production force, computers have caused a tremendous change throughout the world; thus, there are people who call this another industrial revolution. A Chinese American told me that as far as thinking and intelligence are concerned, the Chinese are by no means inferior. In the United States, there are many Chinese participating in the work on computers and large-scale integrated circuits. As a matter of fact, we have not started too

late. Why can't we carry out our plans? Primarily because of the "Great Cultural Revolution" and, at the same time, we had problems in education, technology, organization, and policy, etc. Our primary reason for holding this meeting is to solve problems that have been exposed in the various areas, increasing our understanding, unifying ideas, dedicating our hearts and souls to the same cause, working out a national unified plan and developing electronic computers and integrated circuits as soon as possible. For this reason, whether the decisions made at this meeting are correct or not, we will have a definite role in the development of the electronics industry, and we will also have a major effect on our country's four modernizations program. This meeting is not an academic discussion session, but one that gives the final verdict, a policy-making meeting. It will become a milestone in the history of China's development of computers and integrated circuits. We began the two guided missile projects in 1956 and the conditions are better now than they were in the past. One condition is that we have the country's open policies, and the other is that we have gained numerous experiences. In addition, we have trained a large group of cadres. We must work hard for the prosperity of the country. I believe that with this kind of determination and organization, our work will be carried out and it will certainly be possible.

Precisely due to the significance of this meeting, I therefore asked everyone to have the correct attitude about this meeting from the beginning: Everyone is responsible; start to think, ponder over this seriously, draw on collective wisdom and absorb all useful ideas. Those of you attending this meeting are all nationally renowned experts who put forward scientific knowledge and practical experience and strive to formulate a plan that will fit in a little better with reality. Viewed from the entire process of this meeting, our comrades have all shown the sense of responsibility as masters and a high degree of socialist consciousness, conscientiously and deliberately discussed the plans, and raised many useful suggestions on the debate of the computer series model chart guide. We have not achieved a unanimous opinion, but this is a normal situation. A preselected series model type can be decided on. Should there still be some defects, we can make corrections and improvements in practice until perfection. Don't argue endlessly, otherwise time will slip away. This planning is not departmental or regional planning, but nationwide unified planning. We must view this from the situation as a whole to reflect our overall interests. We must systematically plan and arrange for scientific research, production, and application. We must utilize the forces of various areas according to their strengths so as to bring various positive factors into full play. We must comprehensively consider our long-term directions, general programs, and our short-term concrete objectives to define what we want to achieve within 3 years during the Seventh 5-Year Plan" and up until the year 2000. We must particularly emphasize: ascertaining the major projects to be completed within the next 3 years, grasping what's visible, attainable, and identifiable, and doing and completing them first. I personally think, that the <<Planning Report Outline>>, which we have researched and discussed with leading groups and which Comrades Fang Yi and Lyu Dong [0712 2639] and comrades of other leading groups all have agreed upon, and which was seriously discussed at this meeting, is the product of the wisdom pooled from the masses. For this reason, the various major issues that were defined are basically correct and can be the final say and, therefore, are settled.

Of course, due to the limitations in the conditions of various areas, our planning is not yet perfect; it is a "rolling" plan that needs continuous revision and improvement. However, having a plan like this is different from not having one such as this. With comprehensive unified planning, the nation will have a clear and definite direction and common goal. From now on the coordination and unification in all aspects of practical work will have a realistic foundation and reliable guarantees. This meeting has been properly and successfully conducted due to the collective wisdom drawn from the masses, which has produced a nationwide unified plan.

After this meeting is over, the most important problem will be to pay special attention to really implementing our planning. Otherwise, no matter how good the planning is, it will only be a blank sheet of paper.

Ever since I started this project, acting in accordance with Comrade Ziyang's [4793 7122] request, one outstanding impression is that in the past the work in this area has not been done well. It is mainly described in a word as "scattered." Our understanding was not sufficiently unified; out forces were not sufficiently centralized; coordination among departments was inadequate; and guiding principles and policies were not clearly defined. Therefore, this time planning is the basic starting point for remedying this "scattering." The plan that we have formulated is one that strives hard for a centralized force, stresses the main points, and is a plan that selects and supports the excellent features. To thoroughly implement this plan, it is also necessary to centralize and unify ideas and steadfastly adhere to this basic principle.

Old China was called the East Asian sick man, a pan of loose sand, and the 5-minute Fervor by foreigners. Now the East Asian sick man is no longer sick. During the Asian Games, we won the most championships and are now the East Asian strong man. As for the 5-minute Fervor, we won't have it for 5 minutes; we will have it for 15 years and see what happens. As for being called a pan of loose sand, this time we are organized; unity is strength. We relied on this in launching the two guided missiles and one satellite. It makes it easier to solve the problem of being loose and doing things properly if we are united and centralized.

Why is it necessary to especially stress centralization and unification? Because computers and integrated circuits are a new technology and a new industry where capital funds and technologies are highly concentrated. Large amounts of manpower, materials, and financial resources are required before they can be achieved. Some advanced countries have strong technological forces, where one investment alone would run up to several billions or even tens of billions of U.S. dollars a year. Our country is large, has a large population and has a poor foundation to begin with. It is impossible for us to do likewise. It is possible for us to achieve several big projects only by fully developing the superiority of a socialist planned economy, carrying out nationwide unified plans, centralizing the utilization of our limited manpower material, and financial resources. Recently the State Council held several meetings to discuss the problems of centralizing our forces in carrying out the key construction projects. Electronic computers and integrated circuits were listed by the central authority as one of the national key projects. Therefore, we must stress centralization and unification to prevent reckless developments.

Plans formulated by various units must be linked up with the nationwide unified planning, shorten the battlefront, and transfer some forces and capital funds to insure completion of the state key projects. Presently some localities have money on hand, but do not take into consideration the state plans, do not heed anyone's call and go on their own way. This is wrong. I am solemnly announcing here that units supported by the state on a priority basis must centralize utilization of their financial and material resources in solving scientific research and key production problems. They must not leave their assignments and divide their work specified in the plan and seize the chance to establish their own system and set up new "large and complete" and "small but complete" enterprises. Those units that are not supported by the state on a priority basis must properly play their own roles under the unified planning of the department in charge of the work, and they must not go their own way which would duplicate items and extend the projects contrary to the planned ones. They must not spring up all over the place rushing head-on into massive actions simply because we mentioned the need to speed up development. Those units with poor foundations and those with no prospects for development must be eliminated. They should be closed or merged with other plants. As for those with potential markets for their products, such as microcomputers, the plant arrangements are insufficient and not necessarily suitable. Further research and adjustments can also be carried out.

The current phenomenon of "scattering" is very difficult to centralize and unify. These are problems of ideology.

What is more important is the problem of organization systems. If organizations have their own systems to view problems from their own angles, it will be difficult to unify their intentions. This kind of system causes arguments back and forth and it must be changed. Without reformation, national guiding principles and policies will be difficult to carry out and put into effect. Many rational things will not be done without reformation and there will be duplication and scattering. You jostle me and I'll jostle you. The situations of low efficiency and much waste will not really be overcome. Without reformation the limited financial and material resources of the country cannot be put to their best use, the vast numbers of technical personnel and staff and workers will not achieve the results for the energy and time they spent. Without reformation the fluctuating situation of scientific research and production at low levels will be difficult to change. Even if we have plans that will vigorously develop our undertakings, it will be difficult to put them all into effect. In carrying out the reformation, we must have a tight hold on the critical parts, such as each having its own system by which each carves up his own share and each carries out his own policy. Through reformation we must progressively set up the links between scientific research, production, application, service and qualified personnel training. Departments and areas concerned will rationally share their work, cooperate with one another, and closely coordinate with others in their work. We must not only have a common will, but also a management system which brings the enthusiasm of various departments and areas into full play. This is a major problem and an important matter. Electronic computers and integrated circuits are developing industries; they should be developed systematically and in coordination. Of course, this is not to say that factories will be transferred to certain departments, but the arrangement will be primarily based on unified planning. Everyone must

cooperate and coordinate with each other. No matter which units are responsible for the key assignments or the supporting units, they must coordinate with each other closely, think and work with one heart and mind, fight side by side to complete the key assignments well, and strive for improvements together.

We must take into account the whole country and take the stand of the party's cause in handling problems; never have sectarian bias, and proceed from the point of view of one's own department or unit. As long as it is advantageous for the situation as a whole, we should try hard to make our plan work even to the point of suffering losses. Comrades of the National Defense Scientific Work Commission have indicated that as long as it is advantageous to China's integrated circuits and electronic computers development projects, for the sale of system reformation and promotion of the construction of the four modernizations, we must completely obey state unified planning, and we must resolutely follow the general interests in transferring personnel, factories, and research units. The Liberation Army's communist style of taking care of the whole situation is worthwhile for all of us to learn from, and every department and locality should learn from them. What we mean by transfer is in the sense that some transfers will actually mean lending. The ownership will not change, rather some sections should be coordinated. The idea is not to relocate or transfer things from the National Defense Scientific Work Commission to certain departments. (Comrades Zhang Zhenhuan [1728 7201 1403] and Zhang Aiping [1728 1947 5493] talked to us about such a spirit.) This is precisely the spirit they asked us to follow in doing things. I will repeat it again, this is the kind of spirit we had in launching two guided missiles and one satellite. As long as it is advantageous for development, manpower and materials should be transferred or relocated first. Everyone should follow this practice. (Comrade Fang Yi interrupted: "Personnel, finance, and materials should all be given the green light.) We must all turn on the green light!

To carry out and put into effect the planning, we must grasp firmly and apply this key problem. There are countries in the world, such as Australia and Singapore, that do not manufacture computers or integrated circuits, but they emphasize application, and they have reaped great benefits. Countries, such as the United States, Japan and Soviet Union, both manufacture and apply computers and integrated circuits. These two factors help each other move ahead and progress. I am afraid that no country would only spend great amounts [of money and efforts] on research and production without emphasizing the economic effects on application. It would be foolish to do so. Computers are a new production force. Only when they are being used can they produce economic and social benefits, thereby really benefiting the development of the national economy. Thus, to put planning into effect, we must first be concerned about putting the applications into effect and putting them into effect on economic benefits. Progress of other aspects of work should revolve around application, and organize high volume production of computers. It does not matter if it is the third generation or the fourth generation, the purpose is to equip various departments of the national economy, our armed forces, and defense industries with computers. Application is the starting point and the stopping over point of all our other projects. Because our country follows the financial practice of unified revenue and expenditure, some planning meetings always become fights for investments among various departments. The more appropriations they

get from the state the better they feel. There were not many of these kinds of problems at this meeting, but this is not to say there were none. We must avoid doing things on our own after receiving the allocated funds from the state. Scientific research projects and production projects should be linked with one another. In our meeting an expert kept calling on everyone to sing the same Beijing opera tune. He said it whenever he had a chance. He has a keen sense of responsibility. In order to sing the same Beijing opera tune, the male character type, the female character type, the "painted face" character type, bearded character type and the clown must all cooperate with each other. We hope that under the unified planning, everyone will bring into play the spirit of cooperation and see who does the best in active coordination. Those who do it well will be praised. We must emphasize the key points, and centralize arrangements so that the investments in scientific and technical breakthroughs, technical transformations, and technical imports, capital construction and in domestic manpower and material resources will revolve around the key projects. Leading groups should instruct offices to firmly carry out this spirit which is also a fundamental guiding ideology of fulfilling the plan. The responsibilities of the offices are tremendous; we must speak the truth, not face prestige. (Comrade Lu Dong [0712 2639] interrupted: "Your offices must take a firm hold on these things.")

In conclusion, we must especially stress the problems of strict inspection and supervision. It can be predicted that in carrying out the state unified planning, resistance will be great. In our reformation we will meet a lot of resistance in ideology, resistance in systems, and resistance in reformation. Anyway, the difficulties and resistance will be great. Some comrades kept saying that they support centralized and unified planning during the meeting. They may say the same thing when they return to their respective units, but in practice it is something else. This kind of situation has occurred previously more than once. It is one of the unhealthy manifestations. After this meeting, we must use the planning as standard. The offices will be responsible for organizing the inspections. If what you say is in the planning, but what you do is something else and you are caught, we will use you as a typical case. We will circulate a notice and discipline you for not following the regulations. The comrades attending this meeting will go back to report to the provincial and municipal party committees and party organizations of ministries and commissions. We must define the disciplinary measures and after the planning has been established, we must seriously carry out and put these measures into effect. If you do not make this point clear when you report, we will look for those who attended the meetings and determine where the responsibilities lie. You must make it clear when you return! If you have made it clear and the planning is not carried out, we will look for your secretaries and ministers. We must conduct stringent inspections. If your actions are in favor of the local interests at the expense of the interests as a whole, then you will be economically and legally responsible. As for specific projects, we will establish a system of responsibility whereby a leading person responsible for the projects and a leading person responsible for technologies are assigned. Full discussions on the assignments, requirements, work progress, and conditions, may be held before the projects are determined. After the discussions and a decision has been made, we must set up regulations and require

that work be finished according to the work volume, work quality, and completion time. Quality; I place quality in first place here, meaning that quality must first of all be assured. We must have high standards and strict requirements, starting with the materials. The quality of elements, components, and accessories is the most basic work; quality assurance is a masterly skill. In order to achieve the specified quality, it is necessary to solve the problems of a series of specifications, technologies, operational rules, and the education of staff members and workers. We must have specified work quality, work volumes and completion schedule because time does not wait for our tasks. We can not be dilatory in doing things. As to those people who fail to finish their projects on time, we will look for where the responsibilities lie and punish those who are responsible. Those who finish the job well will be rewarded. Behaving in a lax, undisciplined way does not work and neither does being irresponsible. We must have rewards and punishments and right and wrong must be clearly demarcated. Of course these problems belong to the upper levels of the leading groups; they should be solved in time. Otherwise you should criticize us or you can even request to have us dismissed from our posts. As for what place is completing the work slowly or not on time, or something that should have been done, but isn't, or something that is done incorrectly, we hope that you will make criticism and suggestions to the leading groups in time. What do you do if you keep on suggesting and we do not listen and make changes? Either we will have to leave office or you can demand reorganization. We are making it clear here, and the demands are stringent. The comrades in our leading groups are also responsible to the central authority. In performing a good job, we are doing a good thing for the people. If we don't do it well, don't wait for punishment; quickly request that others replace us; either I will leave my office or several of us will leave. We will let people who are capable of doing this replace us. Let's not occupy the outhouse without defecating. To our group of several people and those people who are present, we want to be responsible. I am announcing this here: We will be responsible to the end. We will make our greatest efforts toward carrying out this project and we must do it well. We are to be responsible to the central authority and to be responsible to you. You are responsible for inspections; let everyone shoulder his responsibility. Being irresponsible is failing to achieve one's assignments and failing to achieve one's assignments will result in one having to leave office himself or even being dismissed. The undertakings must be carried out successfully. This business must be managed properly because time does not wait for us! We must adopt this firm measure, and resolute attitude. Only by doing so will there be any hope in realizing the four modernizations and will there be any hope of vigorously developing China.

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STATUS OF INTEGRATED CIRCUIT PRODUCTION OUTLINED

Beijing DIANZI KEXUE JISHU [ELECTRONIC SCIENCE AND TECHNOLOGY] in Chinese No 6, 1983 pp 3-5

[Article by Parts and Equipment Office, China Electrical Equipment and Materials Company: "Brief Introduction to the Status in Domestic Integrated Circuit Products"]

[Text] China developed its first integrated circuit in 1965 and for the past dozen and more years there have been big improvements in technological level and productive capacity. There are now a total of 28 nationally designated enterprises producing integrated circuits under the jurisdiction of the Electronics Industry Ministry with a production capacity of around 40 million units per year. There are already nearly 1,000 varieties of goods in 13 major categories of products which the factories can supply in batches; product quality has clearly improved and not only can category II and III goods be produced, but "Seven Specialties" and category I goods, which are widely used in military and civilian economic departments, can also be batch produced. Especially in the last 3 or 4 years, domestic integrated circuits have developed and improved rapidly in terms of both variety and quality and product costs and sale prices have constantly declined.

The domestic integrated circuit product situation in line with the 13 major categories is as follows:

I. TTL Circuits

This circuit has a long history of domestic production: output is large and usage is very widespread. There are now five series which are batch produced.

1. CT1000 series. This series is completely identical to the SN74/54 standard series and from circuitry to parameters and leg array are entirely the same and interchangeable with the SN74/54 series. They are now supplied by the Beijing Dongguang Electric Equipment Plant, Beijing Semiconductor Parts Plant No 2, Shanghai Radio Plant No 19, and the Changzhou Semiconductor Plant. The Dongguang Electric Equipment Plant in particular supplies 36 varieties of the 54 series (-55 $\sim$ +125°C) products which are used by key national projects. The CT1000 series is one of the important TTL product series.

2. CT2000 series. This uses the SN74/54H series standards. Some varieties are already produced by the Changsha Shaoguang Electric Equipment Plant, Beijing Semiconductor Parts Institute, Shanghai Radio Plant No 7, and the Shanghai Radio Plant No 19.

3. CT3000 series. This uses SN74/54S series standards, and is a priority development series. Beijing Dongguang Electric Equipment Plant, Changsha Shaoguang Electric Equipment Plant, Shanghai Radio Plant No 7, and Shanghai Radio Plant No 19 are now actively test manufacturing this circuit and have finalized design on a small number of varieties. The Shaoguang Electric Equipment Plant is in the leading position in terms of varieties and parameter norms.

4. CT4000 series. Uses SN74/54LS series standards, is an important TTL product series, and has developed very fast. Average power consumption per gate is as low as 2mW, average delay time is as short as 9.5 ns. In June 1982 the CT4000 series of the Gansu Tianguang Electric Equipment Plant was appraised, and of 28 varieties, 23 met 54 series standards. In 1982, 68 varieties were successfully test manufactured, 200,000 units were supplied, and in 1983, 80-100 varieties will be produced, an output of 1 million units. The Dongguang Electric Equipment Plant, the Shaoguang Electric Equipment Plant in Changsha, the Changzhou Semiconductor Plant, and the Nanjing Semiconductor Parts Plant are now emphasizing test manufacture.

5. T000 series. This series was based on the design of the SN74 series in combination with actual conditions within China, but the parameters are slightly narrower than the 74 series. Of the 28 varieties of medium speed, small-scale circuits (T060-T087), the Dongguang Electric Equipment Plant and Changzhou Semiconductor Plant hold the leading position in quality and the Suzhou Semiconductor Plant's "Seven Specialties" products have already been appraised. For 26 varieties of high speed small-scale circuits (T090-T116), the Dongguang Electric Equipment Plant and the Shanghai Radio Plant No 7 hold the leading position in terms of quality, the Shaoguang Electric Equipment Plant and the Yongguang Electric Equipment Plant in Kaili, Guizhou, participated in key state projects and have made contributions in launching carrier rockets toward the Pacific Ocean. For 61 medium-speed, medium-scale circuits (T210-T883), including counters, decoders, shift registers, data selectors, arithmetic units, parity checkers, and memory, Shanghai Radio Plant No 19 has the most complete line of products, but the speed norms of the Changzhou Semiconductor Plant are high, and consumers report that the quality is high, and Shanghai Plant No 8331 and the Nanjing General Semiconductor Components Plant's product prices are inexpensive and uniformity is good.

In summary, apart from our country's CT4000 series of TTL circuits, development has been somewhat delayed, and though beginning in the last half of 1982 there began to be major breakthroughs, there is still much work that needs to be done in terms of varieties of series, reliability norms, technical conditions, and batch production capacity.

II. HTL Circuits

HTL circuits have very high capacity to resist static, and are mainly used in industrial control, digital controlled machine tools, digital program control, and mobile inspection, and mainly use the design of the product series of the Japanese Toshiba Company. Important domestic production units are Beijing Semiconductor Parts Plant No 3 and the Nantong Transistor Plant. All together they specialize in 16 varieties, the technological conditions are divided into category III, category II, category I_A and "Seven Specialties" and can satisfy the demands of industrial controller design.

III. ECL Circuits

The outstanding characteristic of the ECL circuits are their speed: they are the fastest of the current digital circuits; the average delay time for each gate is as short as 2ns; the average delay time for each gate in the sub nanosecond circuits is less than 0.7ns, the working frequency of the 10K series principal and subordinate structure dual D trigger is greater than 200 MHz; and the work frequency of the III series D trigger is greater than 300 MHz. It is a very important component in the realm of high speed.

Domestic ECL circuits have mainly adopted the Motorola Company's MC10100 series (working temperature range $-30 \sim +85°$), MC10500 series (working temperature $-55 \sim +125°$) and some III series and MC12000 series (high speed phase-locked loop series) and low power consumption SP8000 series (frequency divider circuits). Domestically, they are produced mainly by the Tianguang Electric Equipment Plant which already produces 75 varieties, and now other new varieties are being developed in line with the needs of the whole frames. This plant's ECL circuits were the first domestic digital circuits to break through the $-55 \sim +125°C$ working temperature range, and achieved internationally common technological standards. Actual sales in 1982 exceeded 100,000 and there will be another big increase in 1983.

IV. PMOS Circuits

Apart from the table model machine circuits of Shanghai Radio Plant No 14, there are two other common PMOS digital control series: one is the 5G600 series produced by the Shanghai Parts Plant No 5 and the Nantong Transistor Plant, and the other in the B5100 series produced by the Beijing Semiconductor Parts Plant No 5. The PMOS circuit shortcomings of low speed, high power consumption, and high power supply voltage restrict it to higher level development, and in medium- and small-scale ranges, it will gradually be replaced by the CMOS circuits.

V. NMOS Circuits

NMOS circuits are primarily medium- and large-scale circuits. The Dongguang Electric Equipment Plant and Shanghai Radio Plant No 14 can batch produce 5 varieties of shift registers, 2 varieties of character generators, and 12 varieties of memory.

VI. CMOS Circuits

China's research and manufacture of CMOS circuits began in 1973 and have developed very rapidly since the second half of 1979. Of the several domestic CMOS circuits, major production plants such as Shanghai Radio Plant No 14, Beijing Semiconductor Parts Plant No 3, Shanghai Parts Plant No 5, and the Jiangnan Materials Plant in Nanchang can already supply over 100 kinds of commonly used digital circuits; there are already over 60 kinds which adopt entirely the standards of the RCA Company's CD4000 series; the CC4000 series of the Beijing Equipment and Parts Plant already has 13 kinds which have met the -55 ~+125°C working temperature range appraisal, and have gone into batch production. Actual sales of the CMOS circuits in 1982 exceeded 3 million units. The silicon gate CMOS technology of the Changzhou Semiconductor Plant becomes more mature daily, and 3-18V CMOS products have been evaluated highly by customers. The LED counter-register-decoding drive-display circuit of the Suzhou General Semiconductor Equipment and Materials Plant is being widely used. The CMOS circuit of the Jiangnan Materials Plant has developed very rapidly in the past 2 years (customers have reported that their speed is very fast) and the production of LED display circuits has met the urgent domestic needs for completing the whole frames. Through the joint efforts of production and user units, domestic CMOS digital circuits have come close to international levels. Shanghai Parts Plant No 5 and Beijing Semiconductor Parts Plant No 3 are already batch-producing a one position CMOS microprocessor circuit (MC14500 series). There have also been rapid developments in such nonmilitary use consumer category products as CMOS electronic watch circuits, electronic organs, and pacemakers. In particular Shanghai Parts Plant No 5 and Shanghai Radio Plant No 14 have already produced a CMOS analog circuit which was developed abroad in the middle and late seventies, mainly operational amplifiers CH3130 (CA3130), four operational amplifiers CH4573, 5G14573 (MC14573), chopper automatic (stabilized) operational amplifiers 5G7650 (ICL7650) which have achieved international levels, four voltage comparators CH4574, 5G14574 (MC14574), dual operational amplifier dual comparators CH4575(MC14575), D/A converters 5G7520(AD7520), A/D converters 5G14433(MC14433), and dual time base circuits 5G7556(ICM7556). The Dongguang Electrical Equipment Plant has developed and produced a 3-position semi A/D converter DG7106(ICL7106), and made a new contribution to the growth of integrated circuits in China.

CMOS circuits are divided into three series on the basis of power voltage: 3-18 V series, 7-15 V series, and 8-12 V series, totaling 114 kinds of products. The above-mentioned three series are called the C000 series. Now in trial production are a small number of product varieties of the CC4000 series, the design of which has been finalized using the RCA Company's CD4000, and a definite production capacity has taken shape. It is estimated that by the end of this year or next year the varieties will be sufficiently complete in sets; parameters will reach CD4000 standards, and large quantities will be supplied for use by units with complete sets.

VII. Operational Amplifiers

Apart from the CMOS operational amplifier which have grown rapidly in the past 2 years, in domestic operational amplifiers the development of bipolar type

and monopolar-bipolar combined operational amplifiers has been in a rather sluggish state. Beginning in 1982, the technical standards in general used internationally were adopted demanding that the linear structure, parameters, and leg arrays of products be completely the same as foreign operational amplifiers. Now, except for commonly used type I (low gain), commonly used type II (medium gain), and commonly used type III (high gain) operational amplifiers which can be batch produced, the capacity to batch produce such special types of operational amplifiers as lower power consumption type, high speed type, high precision type, high pressure type, input resistor type, and single power supply type has also taken shape. In particular, the Yonghong Equipment and Materials Plant in Qin'an, Gansu, in the last half of 1982 and early this year successfully test manufactured a low power operational amplifier CF253(μPC253), low drift operational amplifier module OP-3 and OP-4, dual balanced modulation decoder F1596 (MC1596), general-purpose operational amplifier CF741(μA741), current type four operation amplifier F3401(MC3401), and a high-precision operational amplifier CF725 (μA725) and is now emphasizing test manufacture of a broadband amplifier F733(μA733), high speed operational amplifier F318(LM318), high input resistor operational amplifier F357(μAF357), CF3140(CA3140), transconductance type operational amplifier F3080(CA3080), dual operational amplifiers CF747(μA747), F1558(MC1558), and single power supply four operational amplifier CF124(LM124). Beijing Semiconductor Parts Plant No 6 has test manufactured successfully the CF709(μA709) and dual operational amplifier CF747(μA747). The Dongguang Electric Equipment Plant has successfully test manufactured the F358(LM358), CF715(μA715), CF725(μA725), CF741(μA741), the CF3140(CA3140), CF747(μA747), and the voltage comparator F139(LM139), CF124(LM124) samples have also come out one after another. Immediately after some of the above-mentioned varieties were finalized they went into batch production. It is estimated that our integrated operation amplifiers in the next 2 years will make great breakthroughs. Important production units for domestic operational amplifiers are: the Dongguang Electric Equipment Plant, Yonghong Equipment and Materials Plant, Fengguang Electric Equipment Plant in Duyun, Guizhou, Shaoguang Electric Equipment Plant, Beijing Semiconductor Parts Plant No 6, Beijing Semiconductor Parts Institute, Jinan Semiconductor Bureau, Shanghai Parts Plant No 5, Shanghai Radio Plant No 7, Shanghai Plant No 8331, and Wuxi Radio Parts Plant No 1.

VIII. Integrated Stable Power Supply

Although domestic production of integrated stabilized power supplies has a history of 7 or 8 years, the scope of application is narrow and the varieties are few and they cannot be interchanged with foreign products. Now, Shanghai Radio Plant No 7 is already batch producing multi-adjustable type stabilized power supplies W723(LM723) and W1511(SG1511), positive and negative stabilized power supply W1468/1568(MC1468/1568), and at the same time has begun to test manufacture a [triode] fixed type and adjustable type stabilized power supply. Beijing Semiconductor Parts Plant No 5 has already successfully test manufactured a [triode] fixed type stabilized power supply W7800(μA7800) series and W7900(μA7900) series, and is now test manufacturing a [triode] adjustable type stable power supply W117(LM117) and W137(LM137). Wuxi Radio Parts Plant No 1 can now batch produce multi-adjustable type high precision stable power supply W104(LM104) and W105(LM105), and is now test manufacturing a [triode] fixed type and adjustable type stabilized power supply. The Yangzhou Transistor

Plant has produced a camera power supply LVC507 and a multi-adjustable type power supply W3085(CA3085). The Nantong Transistor Plant is also emphasizing the test manufacture of a [triode] adjustable type and [triode] fixed type stabilized voltage power supply. It is estimated that integrated stabilized power supply will have considerable growth this year and the next.

IX. 555 and 556 Time Base Circuits

The 555 time base circuit is a time control circuit which used to be called a timer. Now Shanghai Parts Plant No 5 not only can produce diode type 5G1555 (NE555) but can also produce the CMOS dual time base circuit 5G7556(ICM7556). Wusi Radio Parts Plant No 1 in 1982 also developed a production capacity for several tens of thousands of NE555 per year.

X. Other Linear Circuits

The range of this category of circuit is very broad and consists of other circuits apart from operational amplifiers, power supply and the 555, including power amplifiers, differential amplifiers, medium frequency amplifiers, and radio frequency amplifiers. The domestically produced varieties are now very few and in addition to such products as the power amplifiers D4100(LA4100), D4101(LA4101), D4102(LA4102), and D810(TBA810) which can be supplied in batch production, other types of linear circuits are still at the test manufacturing stage. The Nanjing Semiconductor Parts Plant, Shanghai Plant No 8331, Yongong Equipment and Materials Plant, and the Beijing Electron Tube Plant are now test manufacturing.

XI. Interface Circuits

Separated by usage, these can be divided into the following types: 1. peripheral drivers, 2. MOS drivers, 3. magnetic core drivers, 4. display drivers, 5. long line circuits, 6. read out amplifiers, 7. A/D, D/A conversion, 8. voltage comparators, 9. monostable triggers and Schmitt triggers. There are many kinds of interface circuits. Some of the varieties which can be produced domestically are mainly those produced by circuit production plants in accordance with the demands for fitting important products. A point of emphasis from now on will be to expand the number of varieties.

XII. Dedicated Circuits

This type of circuit refers to television circuits, radio receiver circuits, recording circuits, electric watch circuits, acoustical circuits, electric organ circuits, microprocessor circuits, and other special use circuits.

The television circuit assembly lines which we imported from the Toshiba Company in Japan has already gone into production in the Jiangnan Radio Equipment and Materials Plant in Wuxi and has a production capacity of 26 million television circuits per year. This circuit is used in both color and black and white television sets. Three of them can be assembled into a black and white set, and four can be assembled into a color set. Costs are low, prices are inexpensive, and uniformity is good, and it has already achieved the levels of similar goods abroad. This equipment is also used for producing radio receiver circuits and recorder circuits.

Electric watch circuits have been test manufactured domestically by Beijing Semiconductor Parts Plant No 3, Jiangnan Materials Plant, and Dongguang Electric Equipment Plant. The largest batch producer is the Dongguang Electric Equipment Plant which has already imported an assembly line and put it into production in its Dajinghua Factory. Each circuit sells for 1.5 yuan. The Beijing Semiconductor Parts Plant No 3 and the Jiangnan Materials Plant are already producing electric watch circuits.

Electric organ circuits are made up of 12 kinds of CMOS medium size circuits, and Beijing Semiconductor Parts Plant No 3 has already finalized design and batch produced them.

Cardiac pacemakers (produced by Beijing Semiconductor Parts Plant No 3) and automobile ignition circuits (produced by Shanghai Plant No 19) have already gone into batch production.

To develop China's microdevices rapidly, in the past few years, research, development and production of microprocessor circuits have been organized domestically, and one-bit, four-bit, and eight-bit microprocessor circuits and 2900 bit slice circuits have been test manufactured and there has been a certain degree of development. The four-bit microprocessor of the Dongguang Electric Equipment Plant is based on the Japanese SM-2, and batch production capability uses NMOS technology. Shanghai Radio Plant No 14's four-bit microprocessor adopted multiple slice type structure to achieve broader application. For eight-bit microprocessor circuits, Shanghai Parts Plant No 5 used 16 varieties of the Intel Corporation's 8080 series. The Dongguang Electric Equipment Plant used 7 varieties of the Motorola, Incorporation's 6800 series, and quite a few single chips CPU and interface circuit products of these 2 series have already been developed and produced. The Tianguang Electric Equipment Plant is now developing a 2900 bit slice circuit, and this year may produce many samples for test use in the whole frame units.

XIII. Special Integrated Circuits

These circuits are mainly various sensor type integrated circuits and in domestic production now there are only Hall integrated circuits and integrated photoelectric coupling circuits.

Hall integrated circuits are basically of two types: switching type or linear type. Hall switching circuits are mainly used in contactless electromagnetic control switching and electro-magnetic sensor automatic control. Hall linear circuits' main use in electro-magnetic changeover is in the situation of linear relation and in all kinds of electromagnetic measuring. The Hall circuits produced by the Nanjing Semiconductor Parts Plant through trial use in research units and plants generally are reported to be a rather ideal switch with outstanding performance, high reliability, no contact, no flutter, no sparking, and long life, and is most appropriate for applications which demand high reliability, and is a special semiconductor circuit with bright prospects for growth.

Although China's integrated circuits have developed rapidly in recent years, whether in production or in application there is still a big gap in comparison with advanced international levels. We should continue to work hard and change as fast as possible the backward situation in our integrated circuit production so that within a dozen or so years we will become one of the world's important producing countries of integrated circuits.

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PRINÇIPAL MANUFACTURERS OF SEMICONDUCTOR INTEGRATED CIRCUITS

Beijing DIANZI KEXUE JISHU [ELECTRONIC SCIENCE AND TECHNOLOGY] in Chinese No 6, 1983 backcover

[Table compiled by the China Electronics Equipment and Materials Company, Parts Office: "Principal Manufacturing Plants and Managerial Units of Semiconductor Integrated Circuits in China"] [Excerpt]

[Text]

Unit	Address	Cable Address	Phone	Principal Product Series
Jiangnan Radio Equipment and Materials Plant	Wuxi, Jiangsu	Wuxi 0584	27131	color (b/w) TA series TV circuits, TA series recorder circuits
Jiangnan Materials Plant	Nanchang, Jiangxi	Nanchang 0030	64826	CMOS digital circuits, CMOS display circuits, CMOS "4 in 1" modular circuits
Yonghong Equipment Plant	Qin'an, Gansu	Qin'an 1969	106	linear circuits, ministry-standard operational amplifiers, and operational circuits based on various international standards
Tianguang Electric Equipment Plant	Qin'an, Gansu	Qin'an 1921	1226	ECL circuits and phase-locked ring TTL74/54LS series (CT4000 series)
Yonghong Electric Equipment Plant	Kaili 3057	Kaili 3057	211	TTL ministry-standard medium speed and high speed circuits, TTL74 standard circuits (CT1000 series), acoustical circuits
Dongguang Electric Equipment Plant	Beijing	Beijing 0878	471231	TTL ministry standard medium speed and high speed circuits, 74/54 standard series,

				74H series, 74S series, operational amplifiers, NMOS circuits, 4-bit microprocessor circuits, CMOS digital circuits, large scale memory
Fengguang Electric Equipment Plant	Duyun, Guizhou	Duyun 7364	2931	operational amplifiers, acoustical circuits
Shaoguang Electric Equipment Plant	Changsha, Hunan	Changsha 9995	24334	TTL ministry-standard medium and high speed circuits, 74 standard series, 74H series, 74S series, 74LS series, operational amplifiers, voltage amplifiers, interface circuits
Beijing Semiconductor Parts Plant No 2	Beijing	Beijing 2700	471514	TTL ministry-standard medium speed medium and small scale circuits, 74 standard series, 74H series, 74S series, interface circuits
Beijing Semiconductor Parts Plant No 3	Beijing	Beijing 0584	751185	CMOS digital circuits, CMOS one-digit microprocessor circuits, electric organ circuits, CMOS civilian use circuits, HTL circuits, power amplifier circuits, watch circuits
Beijing Semiconductor Parts Plant No 5	Beijing	Beijing 0709	441931	PMOS digital circuits, integrated stabilized power supply, operational amplifiers, CMOS circuits
Beijing Semiconductor Parts Plant No 6	Beijing	Beijing 0891	330891	TTL ministry-standard medium speed medium and small scale circuits, operational amplifiers
Beijing Semiconductor Parts Institute	Beijing	Beijing 9089	275525	operational amplifiers and linear circuits
Tianjin Semiconductor Parts Plant	Tianjin	Tianjin 3514	563201	TTL ministry-standard medium speed medium and small scale circuits, 74 standard series, acoustical circuits

Jinan Semiconductor Institute	Jinan, Shandong	Jinan 7660	43141	operational amplifiers analog multipliers, voltage comparators and 555 timers
Qingdao Semiconductor Institute	Qingdao, Shandong	Qingdao 6103	26013	operational amplifiers
Shanghai Parts Plant No 5	Shanghai	Shanghai 4307	530140	CMOS digital circuits, CMOS analog circuits, CMOS one-bit microprocessor circuits, operational amplifiers, 555 and 556 time base circuits, PMOS digital circuits, stable power supplies, 8080 microprocessor circuits, large scale memory
Shanghai Radio Plant No 7	Shanghai	Shanghai 0012	663075	TTL ministry-standard high speed circuits, 74H series, 74S series, operational amplifiers, integrated stabilized power supply, acoustical circuits
Shanghai Radio Plant No 14	Shanghai	Shanghai 4873	372799	CMOS digital circuits, CMOS analog circuits, 4-bit microprocessor circuits, 8-bit microprocessor circuits, CMOS "4-in-1" modular circuits
Shanghai Radio Plant No 19	Shanghai	Shanghai 1790	393101	TTL ministry-standard medium speed, medium and small scale circuits, 74 standard series, 74H series, 74S series, 8080 microprocessors and interface circuits
Shanghai Plant No 8331	Jixi, Anhui		Shanghai 662051	TTL ministry-standard medium speed, medium and small scale circuits, operational amplifiers, integrated stabilized power supply, analog multipliers, medium frequency amplifiers, acoustical circuits
Changzhou Semiconductor Plant	Changzhou	Changzhou 0584	3598	TTL ministry-standard medium speed, medium and small scale circuits, TTL high speed circuits, 74 standard

				series, 74LS series, CMOS silicon gate digital circuits, silicon gate high speed CMOS circuits, 8080 miroprocessors and interface circuits
Suzhou Semiconductor Parts Plant	Suzhou	Suzhou 0161	4661	TTL ministry-standard medium speed, medium and small scale circuits, CMOS "4-in-1" modular circuits, CMOS digital circuits, integrated photoelectric couplers
Nanjing Semiconductor Parts Plant	Nanjing	Nanjing 2533	41813	TTL ministry-standard medium speed, medium and small scale circuits, TTL high speed circuits, 74 standard series, Hall switch circuits, Hall linear circuits, acoustical circuits
Wuxi Radio Parts Plant	Wuxi	Wuxi 4848	24031	integrated stabilized power supply, 555 time base circuits, multiple operational amplifiers, dual difference multipliers, 75 series interface
Nantong Transistor Plant	Nantong	Nantong 2533	2409	PMOS digital circuits, HTL circuits, integrated stabilized power supply, interface circuits
Yangzhou Transistor Plant	Yangzhou	Yangzhou 2533	111	operational amplifiers, Darlington circuits, integrated stabilized power supply
Fujian 8430	Mingxi, Fujian	Mingxi 1311		monostable triggers, Schmitt circuits

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JIAOTONG UNIVERSITY'S 16-BIT SINGLE-BOARD MICROCOMPUTERS INTRODUCED

Beijing JISUANJI SHIJIE [CHINA COMPUTERWORLD] in Chinese No 11, 5 Jun 83 p 1

[Article: "Shanghai Jiaotong University Has Assembled Two Types of 16-Bit Single-Board Microcomputers"]

[Text] The Microcomputer Laboratory of Shanghai Jiaotong University recently introduced the MIC-68K and the MIC-8K2 16-bit single-board microcomputers. The MIC-68K is built around a 68000 microprocessor with 32K RAM and 16K-32K EPROM, and has high numeric and real-time processing capabilities. One feature is that all the supporting circuits for the 16-bit CPU are 8-bit I/O chips. Its peripherals include a CRT terminal, a line printer, a cassette recorder and an EPROM programmer. The entire single-board is 305 mm x 200 mm x 15 mm, uses +5 volts (800 milliamperes), +12 volts (50 milliamperes), -12 volts (50 milliamperes). As an OEM product, the MIC-68K can be applied to process control, real-time processing, education, etc. The MIC-68K can be used as a development tool for the 16-bit microcomputers.

The MIC-8K2 single-board computer uses Z8002 as the CPU, and is capable of 32-bit fixed point multiplication and division directly. It has a relatively rich resource board fitted with a 32K byte RAM and a 32K byte EPROM, five parallel I/O ports, three serial I/O ports, and two timers/counters. Its resource sharing decision logic helps the single-board microcomputer to be configured into a multiprocessor system. The MIC-8K2 can use a lot of software, and it includes a monitor, a text editor, an assembler, and a disassembler, altogether occupying 16K bytes. Similar to the MIC-68K, it also can be connected to CRT, printer, and cassette.

CSO: 4008/165

RAILWAY SYSTEM USES SOFTWARE FOR OPTIMIZING GOODS TRANSPORTATION

Beijing JISUANJI SHIJIE [CHINA COMPUTERWORLD] in Chinese No 11, 5 Jun 83 p 1

[Article: "China's Railway System Trail Uses the Software Package for Optimizing Goods Transportation"]

[Text] The Beijing International Economic Information Center's "software for optimizing goods transportation by railway" has recently passed the technical appraisal in Beijing after a year's trial use.

The software package uses linear programming to obtain optimum transportation schemes. It is capable of rapidly calculating the optimal transportation mode regarding loading/unloading of any kind of cargo for several thousand business stations in the nation's railway network. Furthermore, the system can also satisfy individual needs such as the transportation charts printed in Chinese characters. The I/O control system is simple and provides printout for the use of the Ministry of Railways. This new software is used on the mainframe computer model B6810 and minicomputer model HP3000 in the ALGOL language.

It is recognized by the evaluation meeting of the New Technology Bureau of the State Science and Technology Commission. With respect to the economic aspects they decided that the system is simple, direct, and can satisfy the 8-point needs of the current railway transportation system. During last October of the tryout period, just the transportation of nitrogen fertilizer alone was able to save the state 230,000 yuan and transportation of 17.71 million ton-km. Information about our state's network of several thousand business stations is stored in the machine, so this program can be used for any railway transportation problems. The system facilitates modifications and thus can be adapted to changes in the railway network.

CSO: 4008/165

KD-4 MICROCOMPUTER TO BE PRODUCED BY WUHAN FACTORY

Beijing JISUANJI SHIJIE [CHINA COMPUTERWORLD] in Chinese No 11, 5 Jun 83 p 1

[Article: "Wuhan Will Soon Produce a Popular Microcomputer"]

[Text] Wuhan Radio Factory No 2 has recently decided to produce the KD-4 microcomputer developed by the China University of Science and Technology. This computer uses 3.25 MHz Z80A CPU, is equipped with 16K byte RAM and 12K byte ROM, can drive several home TV sets, displays 24 lines x 32 characters or graphics, and will be a low-priced and multifunctional microcomputer.

The major use of the KD-4 will be in education. Its use of BASIC, programming, calculation, and display of graphics and Chinese characters are all very easy. Students who know BASIC already need only about 10 minutes of explanation and guidance to be able to master the major operations, programming, and calculating. After a 2-hour practice, they will be able to control the machines with ease.

The KD-4 can also serve various departments in medium and small computers.

CSO: 4008/165

THIRD NATIONAL MICROCOMPUTER SYMPOSIUM HELD IN GUANGZHOU

Guangzhou NANFANG RIBAO in Chinese 10 Dec 82 p 2

[Article: "Applications and Research of China's Microcomputers Enter New Phase"]

[Text] At the Third National Microcomputer Symposium in Guangzhou, our reporter learned that the applications and research of microcomputers in China have entered a new phase. In the past few years, there were only a handful of large cities which just began to look into the applications of simple prototype machines; today, the overwhelming majority of cities and provinces across the country have already gone into application and research. In production, China has already developed from simple imitation to designing its own models.

In recent years, our country has made tremendous strides in the application and research of microcomputers. Some 300 senior, middle-aged and young representatives from 27 provinces and cities nationwide participated in the symposium, and more than 300 academic papers were presented at the meeting, including some relatively high quality papers by representatives from remote border regions. Microcomputer application and research have already branched out from educational and scientific research organizations into the production field. For example, in machinery, microcomputers are used for controlling machine tools and processing special-shaped materials; in the textile industry, they are used for designing patterns and automatic checking; in agriculture, they are used for seed selection. They are also used for dispatching in transportation, separating parcels in post offices, and auxiliary diagnosis in medicine, etc. They have helped to bring about remarkable results in our country's economic construction. From the many academic papers presented at the symposium, it can also be seen that China's microcomputer research has greatly improved in quality, and our country has developed from imitation to a stage where we are able to design our own microcomputer systems using chips produced in this country. Some projects have entered new realms involving a fairly high degree of difficulty, and some results have been achieved in such areas as multiprocessor system, computer network, application software, etc.

Jiang Shifei [5592 1102 7456/7378], chairman of the China Computer Society and researcher, presented the following suggestions on how to further develop China's microcomputer enterprise: (1) Formulate plans for developing microcomputers, and organize joint efforts to tackle major problems which could bring

about remarkable economic results; (2) Establish a national software center; unify the development and registration of software, as well as awarding and popularization work; (3) Vigorously popularize applications; award projects which produce relatively great economic results; organize evaluations of all kinds of domestically produced microcomputers, the best of which should be selectively supported by the state; (4) Under proper guidance, selectively import foreign advanced technologies and models; emphasize importation of technologies, guard against aimless purchasing of equipment; (5) Set up microcomputer technical consulting services, enhance domestic and foreign information exchange work; (6) Popularize microcomputer application techniques among scientific and technical personnel of various fields, and promote popular-level microcomputer education among leading cadres and administrative people at all levels; open computer application courses in college-level and intermediate-level training schools, as well as adequately equipped high schools.

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CSO: 4008/105

MICROCOMPUTER CHINESE CHARACTER PROCESSING SYSTEM DESCRIBED

Shenyang XINXI YU KONGZHI [INFORMATION AND CONTROL] in Chinese No 2, 1983 pp 9-12, 27

[Article by Shen Jialin [3088 0857 7792] of the Zhejiang Institute of Computer Technology: "Processing Chinese Characters by Microcomputer"; paper received on 4 September 1982]

[Text] This paper describes a working microcomputer output system for Chinese characters that can handle 5,000 to 10,000 characters.

I. Introduction

Imported microcomputers do not have Chinese character output capability and are very inconvenient to use for that purpose. Chinese character output using microcomputer has become an urgent problem and it is not an easy one to solve.

There are 26 letters in the English alphabet and there are 128 ASCII codes (an American information interchange code) commonly used in computers. If a 5 byte signal (see Fig. 1) is used for each ASCII code (expressed by 5x7 dot matrix), it takes no more than 1 Kbyte to express all the ASCII codes. But it is not so simple for Chinese characters; one one writes Chinese characters with a 14x16 dot matrix and uses 32 byte binary to express the character (see Fig. 2), then 1 Kbyte of memory can only store 32 Chinese characters. In general applications, a Chinese character processing system needs 5,000-10,000 characters and a microcomputer usually has 64K of internal memory.

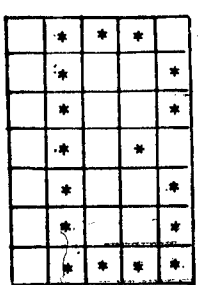


Fig. 1. Letter B expressed by 5x7 dot matrix and the corresponding binary signal: 00, 7F, 41, 49, 76

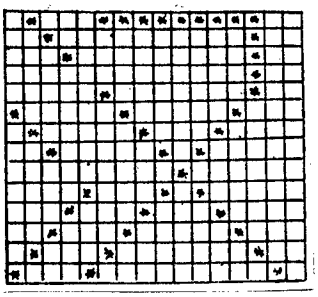


Fig. 2. Chinese character han [STC 3352] expressed in 14x16 dot matrix and the binary signal: 20, 41, 02, 04, 00, 11, 21, 41, 01, 01, 01, 41, 21, 1F, 00, 00, 40, 20, 11, 08, 48, 20, 10, 08, 05, 02, 05, 08, 10, 20, 40, 00.

In this paper we present an experimentally verified method to solve the problem of inadequate internal storage.

II. Basic Ideas

1. What is the solution to inadequate internal storage?

Most of today's microcomputers are equipped with disk drives. Some can drive two 5-inch floppy disks and some can drive two or more 8-inch floppy disks. A 5-inch double-sided single density floppy disk has 171K of memory and an 8-inch double-sided single density disk has 1,000 K (1 megabyte) of memory. Using 14x16 dot matrix to represent Chinese characters, a double-sided single density 8-inch disk can store 32,000 characters. The storage problem can therefore be solved by storing Chinese character signals on disks. Two problems that remain to be solved are of course the generation of the Chinese characters and the rapid access to them on the disk. To solve these two problems, a Chinese character processing method must first be established.

The solution to inadequate internal memory is to store the character code in the internal memory and the character library is allowed to reside on the disk and is not called into the internal memory.

A Chinese character may be encoded as a four digit binary-coded-decimal number. For example, the character "han" [STC 3352] is coded as 2626 according to the standard GB-2312-80 code.[1] It therefore requires only two bytes and 1,024 characters may be coded with 2 kilobytes. We shall now describe an example of building a 1,000 character library file.

A 1,000 character library in 14x16 dot matrix representative may be divided into two files. The Chinese character library file does not exceed 32K bytes and the Chinese character index file does not exceed 2 Kbytes [sic]. In processing the Chinese characters, only the processing program is called into the internal memory. The processing program calls the index file into internal memory and lets the character codes remain in the internal memory. To print a Chinese character, one must first search for the code of the character from internal memory. If the code is not found, the CRT displays that the character

is not in the library. If the code is found, the address corresponding to the character code is then located. Based on the address, the 32 byte binary signal for the character is next found from the character library on the disk. The signal is entered into the Chinese printer buffer for printing. Since one line contains about 88 Chinese characters (a Chinese character is 1.5 that of an ASCII code), one line of characters takes up only 3 K of memory in the print buffer and the remaining storage is insufficient for the user. This sums up the central idea of this paper.

A Chinese character processing system as described above can therefore use high level languages and can output Chinese characters when needed.

2. Building a character library

(1) Generation of an arbitrary character

The flow diagram for the generation of an arbitrary character on the CRT is given in Appendix 1 (this program is called Y1.COM) and the internal memory distribution is shown in Fig. 3. The program is written in assembly language to facilitate the generation of characters in internal memory. When the program is run, a character map such as that shown in Fig. 4 appears on the CRT. After the code of this character (either standard or user defined) is entered, the CRT inquires about the generation method. There are two generation methods--code method and graphical method. In the code method the 32 binary signals are printed on the matrix in eight coordinate directions using commands on the keyboard. Figure 5 shows a generated character. By pressing down a button, the character pattern is automatically transformed into binary signals and stored into internal memory. After a number of characters are generated, they may be stored on the disk. The program allows the user to change any of the characters generated and to erase the character and regenerate it. The encoding may be carried out in any sequence.

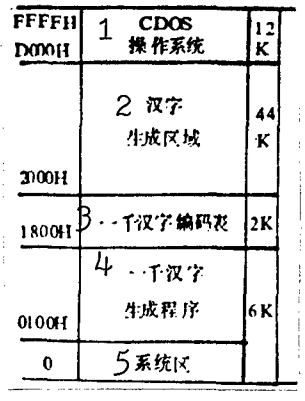


Fig. 3. Internal memory distribution of Y1.COM, a character generation program for 1,000 Chinese characters.

Key:
1. Operating system
2. Chinese character generation zone
3. 1,000-character encoding table
4. 1,000-character generation program
5. System zone

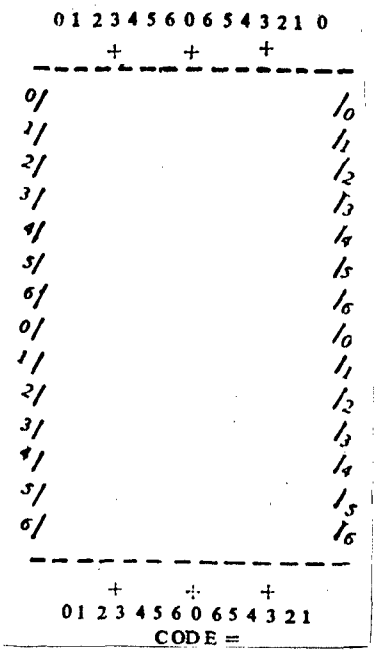


Fig. 4. Character map on GRT alphanumeric display

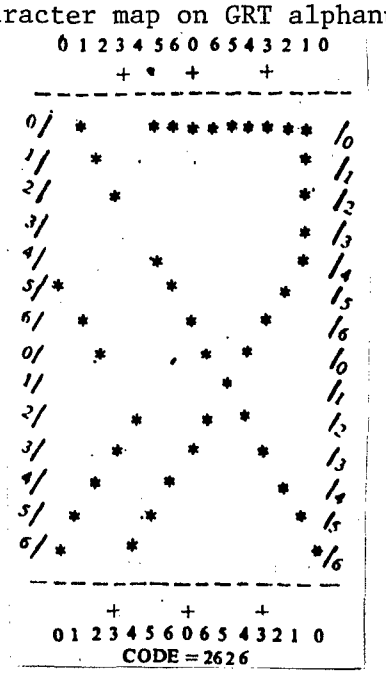


Fig. 5. A generated Chinese character

As can be seen from Fig. 3, space is allocated in the internal memory for only 1,500 Chinese characters. When more characters are needed, there are two approaches. One method is to build the main character library from sublibraries and the other method is to build the main library from direct read-write and logic blocks.[2]

(2) Building main library from sublibraries

We shall call a 1,000-character library (containing 1 to 1,000 characters) a sublibrary and give an example of building a main library from 10 sublibraries. This is usually done on an 8 inch disk.

First generate the 10 sublibraries on the disk using the generation method for 1,000-character libraries. (The number of characters in the library can be any number less than 1,000 and is divisable by 4)

Let the 10 sublibraries be:

VYX.02; VYX.01

VYX.12; VYX.11

. .
. .
. .

VYX.i2; VYX.i1

. .
. .
. .

VYX.92; VYX.91

where i = 0, 1, ..., 9, and VYX.i2 is a 1,000-character library file and VYX.i1 is a 1,000-character index file. The encoding should be done in a sequentially increasing order but should not be continuous.

A procedure program should be devised so that the index files of the 10 sublibraries may be combined into a single index file for the main library VYX.A1 and the 10 sublibraries may be combined into a single main library VYX.A2. The main library consists of VYX.A1 and VYX.A2. This method of building a main library is fast and easy to modify.

(3) Building a Chinese character main library from direct read-write and logic blocks

In this method of directly forming a main library, very small storage space is used in forming the character and in accessing the character. In forming the character, the 32 binary codes corresponding to the character are written into specific logic blocks on the disk. In the accessing process, the signal is read from the disk into the internal memory. Both read and write are achieved through the operating system of the microcomputer. In this method the speed is lower in generating and correcting the characters, but if the codes are entered sequentially the speed is much faster than building 1,000-character libraries.

(4) Building sublibraries from main library

Once the main library is formed, it would be very desirable if sublibraries can be built from the main library. In some practical applications such as tables, invoices, and statistical tabulations, very few Chinese characters are used. If the main library is used every time, it is not only awkward but also takes up large storage spaces on the disk. If a certain application needs 500 Chinese characters and the main library has 480 of them, then these 480 characters may be put into a sublibrary and the 20 characters not available from the main library may be generated using the 1,000-character generation program. This method would be very convenient and requires only modest storage (16 K or so). Using a special program in assembly language, all 500 characters may be called into internal memory at one time. This scheme is much better than the method of using expanded RAM and resident internal memory.

By combining the two methods described in (2) and (3) above, sublibraries may be built from the main library. A program has been written to build 960 character sublibraries from the main library and it is given the name ZY4.COM. The internal memory distribution of ZY4.COM is shown in Fig. 6.

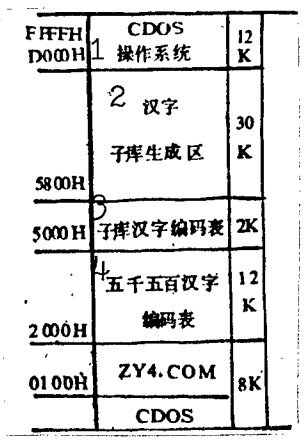


Fig. 6. Internal memory of ZY4.COM

Key:
1. Operating system
2. Sublibrary generation zone
3. Sublibrary character coding table
4. 5,500-character coding table

(5) Seeking character signals from the disk

Searching for the signals corresponding to a character in the main library can be done with the calling system of read and logic blocks. Searching for a character from the 1,000-character library, however, is more troublesome.

We may use the catalog of the character library file to seek the signal of a certain character through the disk sector number distribution table. That is, the internal memory should contain not only the character code table but also the sector distribution table of the character library file.

One of the important measures to increase the speed of seeking a character is to make use of the system call of read-write and logic block.

3. Chinese character processing with high level languages

We shall use BASIC as an example where the processing is done mainly through the USR command. When the user program varies in size, the initial address of the character string defined in the BASIC program also changes, the initial address therefore cannot be held fixed when USR command calls are used to process the Chinese characters. Some preparatory work is therefore required.

First a character string is defined in the user program and the length is to be the same as that of the character processing program. The initial address L_1 of the character string is then computed. Next the character processing assembly source file (a file that carries an expanded Z80 name) is assembled according to the L_1 address and an INTEL hexadecimal file is generated on the disk (an expanded HEX file). Using DEBUG, the HEX file is then transformed into a data file, given an arbitrary name, and stored on the disk. When a Chinese character must be printed while running the BASIC program, the data file is accessed and read to the character string with an initial address of L_1; specific codes (print format, capital, lower case, line advance, Chinese character code, etc.) are entered during the intermittent breaks and E = OSR (L_1, 137) is called to print out the Chinese character. The program returns to BASIC after the printing is done.

Since the defined character string of a fixed length may still be used by the user before and after Chinese character processing, the storage available to the user is still 33 [sic] kilobytes.

III. A Working Microcomputer Chinese Character Output System

Based on the ideas presented in this paper we have made CROMEMCO-C microcomputer a Chinese character output system capable of handling 5,500 characters. Its technical specifications are given in Appendix 2. Its main feature is that it may use high level languages in processing Chinese characters. It has tabulation output and is simple, practical, and low cost. Many units in China today are using the system.

The CROMEMCO-C microcomputer consists of the following main components:

Z80-A 8-bit microprocessor
64K RAM
Two 5¼ inch double-side single density floppy disk drives (360K bytes)
CRT display and M-810 dot matrix printer

In terms of firmware for the Chinese character processing system, circuit modifications were made to the M-810 printer and one plug-in board was added. In terms of software, some application software was added. It should be pointed out that the system also has Chinese output editing programs; like a typewriter, its keyboard may be used to type a script which can then be stored on the disk. Correction, deletion, and insertion functions are also available.

IV. Concluding Remarks

The proposal put forth in this article must be backed up by firmware support. It should be pointed out that no firmware changes are necessary for microcomputers with a graphics printer. Such microcomputers may be converted into a Chinese character output system by merely adopting some software based on the ideas discussed here.

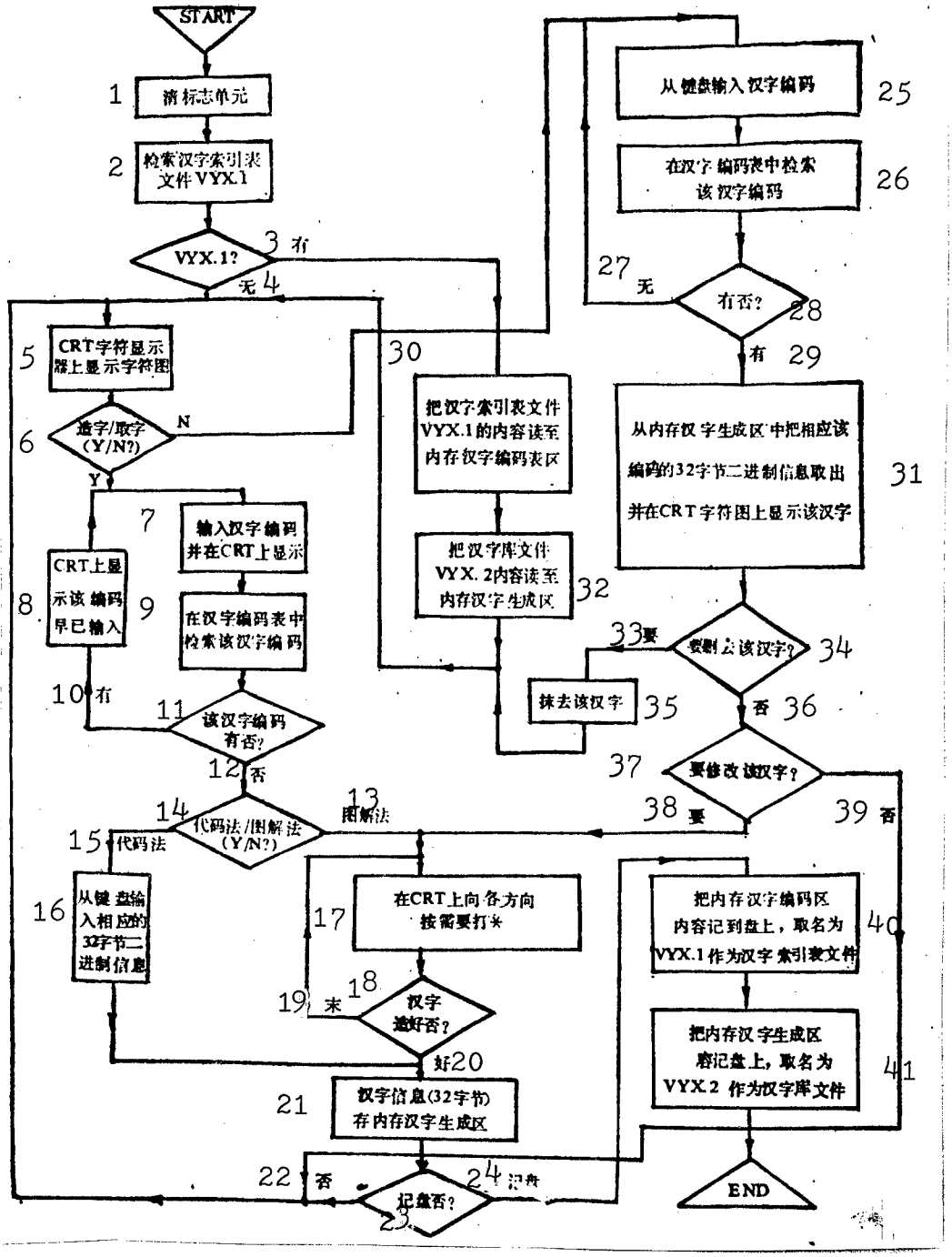
Editor's Note: The flow chart in Appendix I was originally a computer output. It was typeset in this article because it could not be reproduced photographically.

FOOTNOTES

1. GB12-80 is the PRC national standard information interchange Chinese character code published by the State Bureau of Standards, proposed by the Fourth Ministry of Machine Building and drafted by the North China Institute of Computer Technology.

2. For a discussion of "logic block," see CROMEMCO Microcomputer Softwares, Vol 1, pp 249-252, translated by Qinghua University Computer Center

Appendix 1. Flow Chart for the 1,000 Character Generation Program Y1.COM



Key to Appendix 1:

1. Clear flag unit
2. Search for Chinese character index file
3. Yes
4. No
5. CRT display
6. Generate/retrieve character
7. Enter character code and display on CRT
8. CRT shows code has been entered
9. Search for character code in character code table
10. Yes
11. Character code found?
12. No
13. Graphical method
14. Code method or graphical method?
15. Code method
16. Enter the 32 binary codes on the keyboard
17. Print asterisks (*) in various directions on the CRT as needed
18. Chinese character generated?
19. No
20. Yes
21. Store character signal (32 bytes) into character generation zone in internal memory
22. No
23. Saved on disk?
24. Yes
25. Enter Chinese character code on the keyboard
26. Search for the code above in the code table
27. No
28. Code found?
29. Yes
30. Read the contents of the index file (VYX.1) into the code table zone in the internal memory
31. Retrieve the 32 byte binary signal corresponding to the Chinese character from the character generation zone in the internal memory and display the Chinese character on the CRT
32. Read the contents of the library file (VYX.2) into the character generation zone in the internal memory
33. Yes
34. Delete this character?
35. Erase the character
36. No
37. Correct the character?
38. Yes
39. No
40. Store the contents of the character coding zone of the internal memory on disk, name it VYX.1 and use it as the index file
41. Store the contents of the character generation zone of the internal memory on disk, name it VYX.2 and use it as the library file

Appendix 2. CROMEMCO-C Microcomputer Chinese Output System

This system has passed the evaluation in December 1981. The evaluation concluded that the system is simple, practical, and easy to promote. The main features of the system are listed below.

1. Any Chinese character may be generated on the CRT

(1) Characters are printed on 14x16 dot matrix.

(2) Character library is on disk. A 5-inch disk can store a maximum of 5,500 Chinese characters.

(3) Based on the standard Chinese GB2312-80 encoding table, 4,435 Chinese characters have been generated on the disk, including 680 symbols and 3,755 characters in a first level library.

(4) Codes can be arbitrarily changed and characters may be deleted or inserted.

2. Character libraries are easy to generate

(1) Main library may be built from sublibraries and each sublibrary contains 1-1,000 Chinese characters.

(2) Sublibraries may be formed from main library.

3. Chinese character printing and ASCII printing may be alternated by the program and the computing ability is fully used.

4. High level languages may be used directly. Assembly language, BASIC, MBASIC and FORTRAN may be used directly and conveniently in the processing of Chinese characters.

5. Convenient application softwares are available for various practical uses.

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CHINESE CHARACTER CODING METHODS DISCUSSED

Beijing YIQI YU WEILAI [INSTRUMENTATION AND FUTURE] in Chinese No 2, 1983 pp 2-3

[Article by Wang Ziting [3076 3320 1656]: "Elementary Talk on Chinese Character Coding Methods"]

[Text] The electronic computer has entered a new era, and its application has gradually branched out from scientific computation of the early period into such areas as enterprise management, military command, information retrieval, telecommunications, linguistic research, machine translation, typesetting and printing, and medicine. To a certain extent, most of the information processed by such computer systems are related to human language, and information in any language has to be coded in a certain way before it can be entered into the computer processing system.

Historically speaking, the Chinese language is the oldest language in the world today. It is used by over a billion people in our country and other parts of Asia, accounting for over one quarter of the world's population. Moreover, Chinese is also one of the official languages and working languages adopted by the United Nations. Due to the rapid development of our country's socialist modernization, construction, and international exchanges, the Chinese language is becoming increasingly heavily used. As the Chinese written language is composed of approximately 50,000 characters and words which are characterized by the great diversity in frequency of use and morphological patterns, plus the multitude of homonymic variant forms, the method for coding Chinese characters, which is closely related to computerized processing of information in Chinese characters, has become one of the major research topics in the international community today.

Chinese character coding constitutes a system of artificially formulated symbols, and its most basic requirement lies in "monosemy," i.e., each code group corresponds to only one Chinese character. Besides, the coding principles should conform as much as possible to the rules of Chinese character writing, and should be easy to learn as well. Efficiency is another problem, i.e., the coding method should allow high speed manual inputting of Chinese characters through the keyboard. Therefore, the coding of Chinese characters is a frontier science which involves many disciplinary fields, such as linguistics, psychology, computing technology, and statistics. Many scholars

in this country and other parts of the world are devoting their efforts to research on Chinese character coding, and several hundred different kinds of coding methods have been developed now. The numerous Chinese character coding methods can be classified into three broad categories according to the basis of coding: complete character coding, Pinyin coding, and character-form coding.

Complete character coding is the earliest form of monosemous coding method. The currently employed Chinese telegraphic code system is one example. Chinese telegraphic codes employ four decimal digits to express one Chinese character; 0000 to 9999 can be coded into 10,000 individual characters, e.g. 0022 is the telegraphic code of "中," 2429 is the telegraphic code of "文." A simple keyboard of numbers and alphabetic letters can be used for coding. The drawback of Chinese telegraphic coding system lies in the fact that it has no relation whatsoever with the phonetics, forms or meanings of Chinese characters, and hence cannot be used by people who are not in this line of trade.

The complete character coding method is extensively used by the Japanese in keyboards composed of one character per key. Most audiovisual whole-character type Chinese keyboards have approximately 3,000 commonly-used characters. The keys on large keyboards are arranged either according to the order of probability of use or phonetic order of the characters; the operator hits the keys of the characters he reads, and the machine automatically codes the characters. Uncommonly used characters are entered by directly typing in their codes. With this kind of keyboard, it is difficult to find Chinese characters, and it takes a fairly long time to become familiar with it.

Chinese Pinyin romanization is the direction of current efforts to reform the writing system in our country; naturally, quite a few Pinyin coding methods have emerged. As there is a fairly large number of homonymic characters, such as "衣" [yi], "一" [yi], "医" [yi], etc.--there are as many as 66 individual homonymic characters in this group--supplementary information on tones, character forms, character meanings are added onto Chinese Pinyin codes so as to differentiate characters of identical codes. For example, prefixes representing lateral radicals can be added to Pinyin codes: " " is coded as "yu," "迂" is coded "zyu" ("z" is equivalent to the radical "辶"), "字" is coded "gbyu" ("gb" is the equivalent of radical "宀"), and "芋" becomes "cyu" ("c" is equivalent to radical "艹"). There is also a two-letter combination method which can overcome the drawback of ending up with long Pinyin codes, i.e., it can eliminate most long codes by using one consonant letter and one vowel letter to represent one Chinese character; an extra tonal code is sometimes added to differentiate characters represented by identical consonant and vowel letters. If necessary, one more symbol can be added to the code for further differentiation. This way, the coding of each Chinese character will not exceed the length of four, thus facilitating the entry of characters. Generally speaking, the Pinyin coding method is fairly easy to learn, and involves less additional rules. But the Pinyin system has not been popularized yet, and it is impossible for one to use Pinyin to code characters which he cannot read. Moreover, to a certain extent, Pinyin coding is also hampered by the fairly large number of regional dialects in the Chinese language and the great gaps in pronunciation.

Another type of coding method is known as the character form coding method. Basically, it regards Chinese characters of all forms and meanings as combinations of some basic strokes and lateral radicals, e.g., the Kangxi Dictionary holds some 49,000 characters which can be reduced to 214 radicals. The character form coding method breaks a character down into several basic components, i.e., lateral radicals and root radicals which are then combined and coded in a certain way. For example, "李" is reduced into "木子" and thus coded; the character "募" is coded "艹日大力". There is a great gap in the number of basic components among the various character-form coding methods. The Wang company, an American firm, uses a three corner coding method which reduces all Chinese characters into approximately 100 radicals. The three corner radicals determine the coding of characters, e.g., 𠂉 , 文 , and 小 are the top left, top right and bottom right corners of "繁" which is coded "Y54." The stroke form coding method and character reading and code identifying method are relatively easy-to-do character form coding methods. The former separates Chinese character strokes into eight categories; the components of a character are determined and coded according to character structure and the order and positions of character strokes. In the latter method, character form is primary, and phonetics is secondary; the radicals are determined by character forms, and the conversion of radicals into alphabetical letters is based on pronunciation of the component characters. e.g., the coding of "路" is based on four component characters: 口 (kou), 止 (zhi), 文 (wen), 口 (kou); the code "kzwk" is composed of the first letters of each component's Pinyin. The main characteristic of these two methods lies in the simple and clearcut coding rules which are easy to remember and understand, and conform to customary use. Generally speaking, the character form coding method is based mainly on forms and can be used both in our country and other countries. Its drawback lies in the fact that due to the complicated structure of Chinese characters, it is difficult to unify standards for breaking down characters into components, which, to a great extent, increases the operator's burden.

The inputting information in Chinese language is the key to computerized processing of Chinese character information, and there is considerable research going on in this area both in China and other parts of the world. There are different coding bases (i.e., characters, phonetics, forms), methods (letters, numbers, radicals) and keyboards (large keyboards with complete characters, medium-size keyboards tailored specially for radical or Pinyin codes, or small-size English alphabetical keyboards), and newer coding methods are still being developed. It is indeed like a hundred blossoming flowers and a hundred contending schools of thought. On the other hand, out of these hundreds of coding methods, there is not one method that has been universally recognized and/or in common use. Thus, the need for in-depth research and objective evaluation of various kinds of Chinese character coding methods has become a pressing issue. Efforts must be made to learn from the strong points, offset the weak points, and come up with recommendable coding methods as soon as possible.

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YEE8100 MICROCOMPUTER EQUIPPED WITH CHINESE CHARACTER PROCESSING CAPABILITY

Kunming YUNNAN RIBAO in Chinese 9 Apr 83 p 1

[Article by Xiong Zhongshu [3574 0112 3219]: "Yunnan University Successfully Develops Chinese Character Information Processing System"]

[Text] The Radio Department of Yunnan University has added Chinese character processing produced by Yunnan Electronics Facilities Factory. This was accomplished without changing the machine's original functions by installing Chinese character display interface, an EPROM Chinese character library, plus Chinese character processing software. It was the first achievement of its kind in our province.

Research on Chinese character processing systems began way back in 1961 when Professor Zhang Qijun [1728 0366 3449] came up with a plan for developing an automatic typecasting machine which was a fairly advanced idea. Due to lack of experience, the experiment did not succeed. Subsequently, the research work was suspended for a while. From 1970 to before Zhang Qijun died in February this year, the research work was resumed. During this period, with the assistance of Lin Enci [2651 1869 1964] of the Department of Physics, a preliminary plan for building a complete Chinese character coding method was put forward. In 1981, under the guidance of Zheng Sumin [6774 5685 3046], deputy director of the Radio Department, they purchased a YEE8100 microcomputer from the Yunnan Electronics Equipment Plant, and the machine was used for realizing Chinese character processing. In March 1982, they had preliminary success in building a Chinese character library with 2,000 characters, which became a functional system. Over the past half year or so, the performance of the entire system has been stable and reliable; it produces clear, uniform and stable displays of Chinese character forms. At present, they have reduced the number of code keys to 50, thus meeting the requirements of the microcomputer keyboard. The microcomputer Chinese character information processing system has prospects for extensive use. For example, in industrial enterprise management, it can be used for compiling statistical tables and reports, as well as inventory control, etc.; in offices, it can be used for printing documents; news workers can use it for editing articles, retrieving information from files; it can also be used for processing data in commercial and financial departments. As long as it is equipped with the right software, it can be used anywhere that requires Chinese character information processing.

Recently, all the indices and functions of the system were put to overall tests by an evaluation group composed of representatives from Shanghai Fudan University, Chengdu Telecommunications Engineering College, Kunming Engineering College, Kunming Normal College, and Yunnan Electronics Facilities Factory Experts, professors and technical workers from some 30 organizations also took part in the evaluation work, and they concluded that to a certain extent, all of its capabilities were advanced and functional, and the system could be put to small-scale trial production.

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HUNAN DEVELOPS CHINESE CHARACTER COMPUTER OPERATING SYSTEM

Shanghai WENHUI BAO in Chinese 31 Jan 83 p 1

[Article: "Hunan Develops Chinese Character Computer Operating System"]

[Text] Recently in Changsha City, computer specialists and professors from all over the country were very excited when they saw the Chinese character computer operating system developed entirely by Hunan Province. With great enthusiasm, Professor Ci Yungui [1964 0061 2710], a well-known computer specialist, said that the Chinese character computer operating system had reached the advanced levels of this and other countries, and that it had opened up new prospects for developing Chinese language computers.

The Chinese computer operating system was primarily developed by Tang Fonan [0781 0154 0589], a 39-year old deputy chief engineer of Hunan Province Electronics Research Institute, and Zhang Xi [1728 6932], a 42-year old lecturer of Changsha Railroad College. Ten middle-aged and young scientific and technical workers also took part in the development project.

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LIAONING'S COMPUTING CENTER DESCRIBED

Shenyang LIAONING RIBAO in Chinese 26 Feb 83 p 2

[Article: "A Glimpse at Liaoning's Electronic Computer Center"]

[Text] Recently I visited Liaoning Province's Computing Center just to see a computer which had come from Romania 3 years ago to "settle down" in Liaoning.

In the bright and spacious computer room, the silver-gray "visitor" from afar was computing the results of a provincial survey on the life of urban staff and workers at the speed of more than 300,000 operations per second under the control of the operator. I was told by a comrade who was accompanying me that since its arrival in Liaoning, the computer has not only shown extraordinary talent, but also became involved in quite a few interesting stories!

Conscientious and Meticulous

After the nationwide population survey began, volumes of statistical data started to pour continuously into the computing center from all over the province. This was certainly a lot of work for the computer. It should be pointed out that in the population survey, the computer was burdened with the task of processing more than 560 million pieces of data from the entire province, and it was to generate 4,177 tabular reports through computation and analysis of the data. One cannot imagine how to go about such an enormous task if it were to be completed manually. What is even more difficult is the fact that the computer was not to perform the computation mechanically for it also had to examine and balance every single item of data, and perform logic checking as well. For example, if a male was found in the maternity column, the computer would immediately pull out the record and inform the operator of the erroneous entry.

A Real "Consultant"

Last year, the province's planning department had a knotty problem: the bicycle plants were overstocked with large volumes of unmarketable products--was there a way out for the bicycle industry? Should newer models be put out, too? There was a difference of opinion as to what to do about it. Some suggested that the newer models should be put out as planned, but others disagreed on the grounds that the growth of the bicycle industry should develop from

positive to negative. In the midst of the confusion, they decided to seek the advice of the computer "consultant." In no time, the computer examined the problem from every angle and came up with the following prediction: Bicycle production should see some growth within the next few years, but the situation is somewhat different from the past few years when the supply fell short of demand, i.e., while the marketing of popular goods gradually declined, there was a growing demand for high quality goods. The concerned department was very satisfied with the answer, and some said that no one could have come up with such a forecast by racking their brains.

Perceptive Eyes Are Better Than Bolo

Although it takes a Bolo [a famous trainer of horses] to spot a winged steed, even Bolo would feel inferior to an electronic computer. Early last year, at the request of the provincial sports committee, the computer helped to choose soccer players. This was indeed a new topic. In the past, we used to depend on the trainer's observations and experiences in selecting players. Could the computer perform such a task? Some people were rather skeptical. But their doubts were dispelled in no time. With the assistance of the provincial sports committee, the computer performed a survey of 1,042 persons. For each person, it conducted standard statistical and multifactor analyses of 102 primary indices and 198 derived indices; from the 1,042 applicants and 300,000 items of data, it found the internal patterns of the players. Finally, it produced decision functions for determining who was to be eliminated, who needed training, and who was to be recommended in the selection process for the juvenile team, youth team and national team. This way, by entering the test indices of an applicant into the function, it was possible to determine what kind of player his qualities match up to.

Brilliant "Notary"

One day, the Anshan Steel Corporation sent a comrade to the computer center to ask the computer to be their "notary." What happened was that the steel corporation had received some bitter complaints from a customer that the semi-finished products it had produced were too large, and that it had wasted the customer's materials. The pipe welding plant held that the current status should be maintained. Both sides got into an endless argument. As the products in question were irregular workpieces, it was very difficult to calculate precise figures. The computer center accepted the request and proceeded to break the products into various components based on their shapes; different computation methods were employed for each component, and the results were totaled. It took only a week's effort to come up with the final results. Moreover, the precision level produced by the computer turned out to be 100 times greater than what the user had originally requested. Both the plant and the user were satisfied with the scientific data provided by the notary, thus insuring normal implementation of the economic contract.

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COMPUTER-COMPILED TABLE FOR ION-SELECTIVE ELECTRODE CALCULATIONS DESCRIBED

Changchun FENXI HUAXUE [ANALYTICAL CHEMISTRY] in Chinese No 5, 20 May 83 pp 364-367

[Article by Pan Zhongxiao [3382 1813 1321], Department of Chemistry, China Scientific and Technical University: "Computer Compilation of a Calculation Coefficient Table for Double Addition of Standard Solution in Analysis With Ion-Selective Electrodes"]

[Text] In analysis with an ion-selective electrode, a standard solution is generally added in order to decrease the effect of changes in components. Double addition of standard solution has certain advantages, since it is not necessary to know the Nernst slope of the standard solution [1]. But the usual mathematical methods cannot be used with the derived computation equations to determine the concentration of the ion in question, so that there are limitations on the use of the method. The Orion Company [1, 2] has provided a computation coefficient table, but because they have completely neglected the dilution effect resulting from addition of the standard solution, under certain conditions the computation error is rather large, and when calculating C_X from the values of $C_X/\Delta C$, it is still necessary to calculate ΔC. Rather good computation graphs have been provided in reference 3, in which curves for the relationship between $R = (\Delta E_2/\Delta E_1)$ and C_X/C_S are plotted for seven volume ratios (V_S/V_X). These graphs take account of the dilution effect and are more accurate than the Orion tables, but there seems to remain some plotting error, particularly when the values of C_X/C_S are large. In order to provide precise computation coefficients for practical work, we used a TQ-16 general-purpose computer to compile a computation table giving the values of C_X/C_S corresponding to the values of R for 10 different volume ratios. The initial value of C_X/C_S was 0.005, the final value was 0.0409, and the step size was 0.0001. This table provides accurate values with a clear format, and is easy to look up. It is suitable for laboratory use.

Mathematical Principles

When an ion-selective electrode and reference electrode are inserted into the solution of the ion to be determined, according to the Nernst equation the electromotive force [EMF] of the cell should be:

$$E_1 = E^0 \pm S \cdot \log[f_x \cdot K_x \cdot C_x] \quad (1)$$

where E^0 is a constant, S is the Nernst slope (2.3RT/nF), C_X is the concentration of the ion to be determined in the test solution, f_X is the activity coefficient of the ion to be determined in the test solution, and K_X is the fraction of the ion to be determined in the solution which is in free form in the presence of a complexing agent.

When a volume V_S (ml) of standard solution with a concentration C_S is introduced into the test solution, the concentration of the ion to be determined is $(C_XV_X + C_SV_S)/(V_XV_S)$, and therefore the cell EMF becomes:

$$E_2 = E^0 \pm S \cdot \log[f_x' \cdot K_x' \cdot ((C_xV_x + C_sV_s)/(V_x + V_s))] \tag{2}$$

When another volume V_S(ml) of standard solution is added to the test solution following determination of E_2, the concentration of the ion to be determined again changes, becoming $(C_XV_X + 2V_SC_S)/(V_X + 2V_S)$, and accordingly the EMF becomes:

$$E_3 = E^0 \pm s \cdot \log[f_x'' \cdot K_x'' \cdot ((C_xV_x + 2V_sC_s)/(V_x + 2V_s))] \tag{3}$$

In the measurement process, $f_x \cdot k_x \cdot f'_x \cdot K'_x$ and $f'' \cdot K_x''$ may be treated as equal. Therefore, when the standard solution is added twice, the changes in the EMF are expressed as:

$$\Delta E_2 = E_2 - E_1 = s \cdot \log[(C_xV_x + C_sV_s)/((V_x + V_s) \cdot C_x)] \tag{4}$$

$$\Delta E_3 = E_3 - E_1 = s \cdot \log[(C_xV_x + 2C_sV_s)/((V_x + 2V_s) \cdot C_x)] \tag{5}$$

Dividing equation (5) by equation (4), we obtain:

$$R = \frac{\Delta E_3}{\Delta E_2} = \log\left(\frac{C_xV_x + 2V_s \cdot C_s}{(V_x + 2V_s) \cdot C_x}\right) \Big/ \log\left(\frac{C_xV_x + C_sV_s}{(V_x + V_s) \cdot C_x}\right) \tag{6}$$

After finding R from the experimentally determined values of ΔE_3 and ΔE_2, the usual mathematical methods cannot be used to obtain C_X from equation (6).

For convenience in using the computer to compile the computation coefficient table, we rewrite equation (6) as:

$$R = \log\left(\frac{V_x}{V_x + 2V_s} + \frac{2V_s}{V_x + 2V_s} \cdot \frac{C_s}{C_x}\right) \Big/ \log\left(\frac{V_x}{V_x + V_s} + \frac{V_s}{V_x + V_s} \cdot \frac{C_s}{C_x}\right)$$

$$= \log\left(\frac{1}{1 + 2\frac{V_s}{V_x}} + \frac{2V_s}{V_x\left(1 + 2 \cdot \frac{V_s}{V_x}\right)} \cdot \frac{C_s}{C_x}\right) \Big/ \log\left(\frac{1}{1 + \frac{V_s}{V_x}} + \frac{V_s}{V_x\left(1 + \frac{V_s}{V_x}\right)} \cdot \frac{C_s}{C_x}\right) \tag{7}$$

and if we write $A = V_S/V_X$ and $B = C_X/C_S$, equation (7) becomes:

$$R = \log\left(\frac{1}{1+2A} + \frac{2A}{1+2A} \cdot \frac{1}{B}\right) \Big/ \log\left(\frac{1}{1+A} + \frac{A}{1+A} \cdot \frac{1}{B}\right) \qquad (8)$$

Equation (8) is the formula which was used for direct compilation of the computation coefficients table. When A is constant, R = f(B).

Compilation and Use of the Coefficient Table

Considering the actual nature of the measurement, in order to decrease the manipulation error due to adding the standard solution and to maintain the ionic strength and composition of the test solution essentially constant, in accordance with reference 3 the volume of standard solution added should be between 1 to 10 percent of the test solution volume. Therefore, when compiling this table, we used values of A between 0.5 percent and 5.0 percent. To produce a readable table for the actually determined range of R values, the range of values of B was from 0.005 to 0.0409.

The computer program for compiling the table was written in FORTRAN IV. When run on the TQ-16 computer, it compiled the table in only 2 minutes (30 pages of wide-line printer output, 3,600 groups of data). To use the table R is first determined from the experimental data, then the value of the computation coefficient (C_X/C_S) corresponding to the value of R is found in the A (volume ratio) column; this ratio multiplied by the volume of standard solution gives the concentration of the ion being determined.

Computational Examples and Discussion

The coefficient table was used to make a computation for the six examples presented in reference 3, and the results were compared with those obtained by the method of reference 3 and the Orion method (see Table 1). The computed values presented in Table 1 indicate the following:

1. For addition of 1.0 ml of standard solution to 100 ml. the three methods give essentially the same result; for addition of 2.0 or 3.0 ml of standard solution, the Orion method gives a large error.

2. The computation results obtained in reference 3 for measurement results Nos 6 and 8 and Nos 7 and 9 were 5.0×10^{-5}M and 4.8×10^{-5}M respectively, both of which appear to be too large; perhaps this resulted from an error in constructing or reading the graph. It is clear that the values of R in the two cases are 1.565 and 1.48, and if the correct calculated values are 5.0×10^{-5} and 4.8×10^{-5}, then the C_X/C_S values should be 0.02 and 0.019. But the correct calculation results show that when A = 0.02, if the value of B is 0.02, then the value of R should be 1.573; and when A = 0.03, if B is 0.019, then the value of R should be 1.489. It is noteworthy that as the value of B is gradually increased, the equation R = f(B) changes more and more slowly. This may be because there is a relatively large computation error for large values of B. We suggest that in practical work, every effort should be made in design and manipulation to obtain small values of B for use in the

Table 1. Calculation Results for Determination of Fluoride Ion With Double Addition of Standard Solution Using Three Calculation Methods

(testing volume is 100 ml)

No	F^- ion conc. in test solution (M)	F^- conc. in standard solution (M)	Volume added (ml)	EMF (mV)	R value	Calculated F^- ion concentration (M)		
						Orion method	Reference 3	Present method
1	5.0×10^{-5}	5.0×10^{-3}	0	113.2				
2			1	95.9	1.583 from #2,3	4.9×10^{-5}	$5.x \times 10^{-5}$	5.1×10^{-5}
3			2	85.8	1.456 from #3,4	2.4×10^{-5}	5.0×10^{-5}	4.8×10^{-5}
4			4	73.3				
5		2.5×10^{-3}	0	111.2				
6			2	94.2	1.565 from #6,8	2.24×10^{-5}	5.0×10^{-5}	4.8×10^{-5}
7			3	88.7	1.480 from #7,9	1.4×10^{-5}	4.8×10^{-5}	4.5×10^{-5}
8			4	84.6				
9			6	77.9				
10	1.0×10^{-5}	1.0×10^{-3}	0	161.3				
11			1	142.8	1.573 from #11,12	9.3×10^{-6}	9.7×10^{-6}	9.7×10^{-6}
12			2	132.2	1.440 from #12,13	4.3×10^{-6}	9.3×10^{-6}	9.0×10^{-6}
13			4	119.4				

computation in order to increase its accuracy. When this table is used to provide detailed data, ordinary graph paper may be used to plot a smooth R-B curve.

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GUANGZHOU USES MICROCOMPUTER IN PRODUCTION MANAGEMENT

Guangzhou NANFANG RIBAO in Chinese 27 Jul 83 p 1

[Article by Chen Dexin [7115 1795 2946]: "Scientific Research Conducted by the Automation Department of the South China College of Engineering Yields Achievements: Success in Using Computer for Managing Production"]

[Text] The use of a microcomputer for business in production management in our province has for the first time been successful. The Guangzhou Economic Commission assigned the task of "applying microcomputers for production management at Guangzhou Cotton Mill No 2" to be tackled by the collaborative effort of Guangzhou Cotton Mill No 2 and the Automation Department of the South China College of Engineering. The microcomputer was designed and assembled by the Control Theory and Applications Teaching and Research Section, Automation Department, South China College of Engineering, and has been in operation at the Guangzhou Cotton Mill No 2 since last March. It had greatly elevated the mill's labor production rate and scientific management level. Recently, the Guangzhou Economic Commission held a check and accept on-the-spot meeting with regard to its scientific research results. The production uniqueness of the Guangzhou Cotton Mill No 2 is that there are a variety of products, numerous personnel, and complex production factors. In the past, production assessment depended upon labor to process and handle several thousand data items. The task was slow and prone to errors. Since switching to computer usage, the process has become fast, accurate, and stable. During the demonstration, people were able to witness the processing operation, the computer simulates the distribution engineering, rapidly and accurately "thinking," simultaneously selecting the most optimum distribution plan amongst hundreds. Workers expertly feed in production data, the computer is capable of screening within seconds to inform where to conduct product quality control. People also were able to see how, after several minutes of manipulation by the workers, the wide-line printer will produce beautifully compiled complicated reports and tables. The same reports and tables, in the past, would have taken several hours of human labor, days of calculation for the more complicated ones.

Specialists point out that the use of computers is the center of modern management technology, and is a natural tendency for modern production development. This task has met the initial requirements, it is our province's first success in using a microcomputer for overall industry production management. Organized promotion of its application is highly recommended.

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SUCCESSFUL OFFSHORE FISHERY DATA BASE SYSTEM DESCRIBED

Beijing JISUANJI SHIJIE [CHINA COMPUTERWORLD] in Chinese No 11, 5 Jun 83 p 1

[Article by Cao Winqin [2580 2450 0530]: "A Fishery Data Base System Developed Successfully"]

[Text] The Shandong Provincial Computer Center has successfully developed a "fishery data base system," and recently it has officially passed the evaluation test. This Z80-based microcomputer system uses orthogonal operational method to carry out single aquatic product business management. The data base system can provide the fishery companies with all sorts of timely and reliable statistical tables and charts pertaining to the operations of the various production departments and also with tables and charts on the status of China's ocean fishery production by date, month, year and the statistics of a number of years for the General Bureau of Aquatic Products, from which they can visualize the changes and trends in the high and low production areas during the fishing season. The system also provides the research and production headquarters with reliable data on the primary and secondary relationships and distribution of product variety and output and changes in the distribution of fish in the southern and northern fishing grounds.

This system introduces a hierarchical data model which accurately describes the logical structure of the data and reflects the users' need for processing fishery data. It employs the data bank control system of "classification and different-level organization" in the data base management system (DBMS), achieving a data bank system with stronger functions on the microcomputer. Employing the level modular structured programming and overlay technique, the fishery data control system can operate a larger system on a microcomputer, and is easy to modify and expand.

This DBMS is designed logically, saves time and effort and is very cost effective. The use of microcomputers in establishing a fishery data bank technology certainly has great significance in the development and the application of data bank technology.

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IMPORT OF NEW TECHNOLOGIES, EQUIPMENT PROMOTES ELECTRONIC INDUSTRIAL GROWTH IN GUANGDONG

Guangzhou NANFANG RIBAO in Chinese 10 Nov 82 p 1

[Article by Luo Sheng [7482 516B], Lin Shi [2651 0670] and De Kuang [1795 1401]: "Guangdong Province's Flourishing Electronics Industry"]

[Text] Since the 3d Plenary Session of the 11th Party Central Committee, owing to the open door policy towards foreign countries, the electronics industry in our province has undergone tremendous developments. In the past, our province could only produce low grade radio sets, but now it has developed the capacity to produce medium and high grade radio sets, receiver-recorder sets, television sets, electronic computers, etc. Moreover, as compared with all branches of industry in our province, the electronics industry enjoys the highest growth rate in gross industrial output value and profit. The gross industrial output values over the past 3 years were equivalent to 75 percent of the gross industrial output values of the past 10 years prior to the Third Plenary Session.

Owing to the rapid technological development in the electronics industry, the application field of Guangdong's electronics industrial products has expanded from picking up music and news broadcasts to applications in industry, agriculture, forestry, scientific research, education and health care, commerce, finance, traffic and communication, and other sectors, thus greatly promoting the growth of the national economy. Remarkable results have been achieved in the application of Shaoguan City Radio Plant's 112-A electronic computer in cotton textile production. Manufactured by Nanhai Xian Radio Plant, the ZD-065 microcomputer is not only capable of handling data processing and process control in such fields as education, scientific research and industrial automation, but also such applications as monitoring mining safety, gathering detailed hydrological data, automatic sorting of parcels and letters, supervising classroom tests and grading of examination papers with accuracy, and performing every detail of railway dispatching.

The vigorous development of Guangdong's electronics industry is mainly attributed to the importation of advanced technologies and equipment. It is reported that over the past 3 odd years, the entire province has imported a total of 61 advanced production lines, 2,515 pieces of equipment and instruments, which greatly promoted the technical transformation in Guangdong's electronics industrial enterprises, thus helping to improve production capacity, and accelerate the upgrading of products. For some time in the past, Haikou Radio Plant used

to manufacture quartz-crystal oscillators of unstable performance. Several futile attempts had been made to improve the performance. In recent years, they imported advanced techniques and technologies from foreign countries and finally solved the problem; they have now succeeded in bringing six out of nine main technical indices up to the international level. Last year, the plant put out 470,000 quartz-crystal oscillators which were exported to Hong Kong, Japan and the United States, and well received by foreign businessmen.

Thanks to the implementation of the open door policy towards foreign countries, continuous improvements have also been made in enterprise management and administration, which was another contributory factor to the fairly large growth in Guangdong Province's electronics industry. In recent years, 40 percent of the electronic industrial enterprises in our province conducted business with foreign business firms in accordance with the "three comes and one compensation" ["san lai yi bu"] guideline, and gradually came up with some experiences suitable for practical use in Guangdong's enterprise management and administration, thus helping to increase labor productivity and attaining remarkable economic results. As the result of learning scientific management techniques from other countries, Foshan City Photoelectric Equipment Plant doubled its gross industrial output value and tripled its profits from January through September this year as compared with the same period in 1978. Among the various electronic industrial plants in the province, Guangzhou's Shuguang Radio Factory used to incur losses all the time; since 1979 when it made an effort to learn from foreign management techniques, the enterprise has been making increasingly remarkable economic results from year to year. In 1979, the plant turned deficit into profit; besides paying back millions of yuan in debt which it had owned in the past, it also had a small amount of surplus. In 1980, its profit amounted to 480,000 yuan; in 1981, it gained more than 2.4 million yuan.

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VICTOR 16-BIT MICROCOMPUTERS ORDERED FROM HONG KONG FIRM

OW011538 Hong Kong AFP in English 1340 GMT 1 Sep 83

[Text] Hong Kong, Sept. 1 (AFP)--China has ordered 350 Victor 16-bit microcomputers from Swire Systems for $3.5 million, the company announced today.

The technology-import corporation and higher education institutions in China have bought the microcomputers with packages of programming languages plus the Chinese character generator for shipment in September-October.

"This indicates that the Chinese are using these packages to write their own software," said Mathew Wauchope, executive manager of Swire Systems, a computer distributor division of the Swire group of Hong Kong.

Swire System's Chinese character generator is designed by a U.S. firm for Victor microcomputers, products of Victor Technologies Inc., U.S.A.

"The most important advantage of this software is ease of putting Chinese characters into the computers using an ordinary keyboard," Mr Wauchope said. "It takes only two weeks to train an operator."

"There is a great potential in the Chinese market, especially with this new Chinese software. Further development of the Chinese software in continuing and packages for word processing, data processing, accounting and inventory control are already available," he added.

CSO: 4008/210

BRIEFS

HARBIN INSTITUTE DIGITAL COMPUTER--The SLZ-2 model digital fluid quality computer, built by the Radio Technology Teaching and Research Section, Harbin Institute of Technology, passed technical appraisal on the 14th. It was commissioned by the Ministry of Petroleum Industry. The model was tested on-site by the Dongfanhong Oil Refinery, Beijing and was found to have stable performance and to work reliably. Quality control error is less than 1×10^{-3} for gasoline, kerosene and diesel oil. The Appraisal Committee deems the testing results demonstrate an advanced domestic level. [Text] [Harbin HEILONGJIANG RIBAO in Chinese 22 Jul 83 p 1]

DJS-153 PASSES EVALUATION--The Computer Industrial Management Bureau of the Ministry of Electronics Industry sponsored the DJS-153 computer technology evaluation meeting at Weifang [3452 0972] on 18 May. The meeting was attended by a total of 91 representatives of scientific research, production, and operations units. The representatives at the meeting unanimously agreed that Model DJS-153 fully meets the design criteria, i.e., large memory capacity, high speed calculation, fully functioning, reliable operation, high-performance, a lot of software, and completely equipped. The Weifang Computer Factory was the first to assemble this domestic-made high-grade minicomputer which has up-to-date technology and improved parts. It has compact structure, logical layout, easy maintenance, and more than a hundred compatible software items. Thus, it is currently one of the better price/performance products. This model is suitable for use in defense, scientific research, education, business management, and automatically controlled data processing of commercial and routine work management. [Text] [Beijing JISUANJI SHIJIE [CHINA COMPUTERWORLD] in Chinese No 11, 5 Jun 83 p 1]

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